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Davidson, Davidson & Kappel, LLC
485 7th Avenue
14th Floor
New York, NY 10018

EXAMINER	
ROE, JESSEE RANDALL	

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/728,239
Filing Date: December 03, 2003
Appellant(s): MARDON ET AL.

John S. Economou
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 24 February 2009 appealing from the Office action mailed 18 August 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 5,648,995	Mardon et al.	07-1997
US 5,832,050	Rebeyrolle et al.	11-1998
US 6,863,745	Charquet et al.	03-2005

Mallory-Sharon Metals Corp., Ashtabula, Ohio, "Zirconium Analysis by Production Control Quantometer" Analytical Chemistry (U.S.) Formerly Ind. Eng. Chem., Anal. Ed.; Vol: 31, No. 11, pp. 1867-1868, 1 November 1959.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mardon et al. (US 5,648,995) with evidence from Easterday (Zirconium Analysis by Production Control Quantometer) in view of Rebeyrolle et al. (US 5,832,050).

In regards to claims 1-3, Mardon et al. (‘995) discloses (abstract) a zirconium based alloy that is made into tubing sheaths (sheet) for nuclear fuel rods as shown in the table on the following page.

Element	**From Instant Claims** (weight percent)	**Mardon et al. ('995)** (weight percent)	**Overlapping range** (weight percent)
Fe	Must be present	50 – 250 ppm	50 – 250 ppm
Cr	-	-	-
V	-	-	-
Fe+Cr+V	200 – 700 ppm	50 – 250 ppm	200 – 250 ppm
Nb	0.8 – 1.3	0.8 – 1.3	0.8 – 1.3
C	0 – 100 ppm	0 – 200 ppm	0 – 100 ppm
S	10 - 35 ppm	-	-
Si	0 – 50 ppm	0 – 120 ppm	0 – 50 ppm
O	1100 – 1700 ppm	0 – 1600 ppm	1100 – 1600 ppm
Sn	>0 – 100 ppm	-	
Zr	remainder	remainder	remainder

Mardon et al. ('995) discloses the elements as shown in the table above, but Mardon et al. ('995) does not specify the amounts of chromium, vanadium, and sulfur.

Easterday discloses that zirconium would contain 20-450 ppm chromium, 20-50 ppm vanadium and 20-50 ppm tin as impurities (Table III and page 1867, 1st column, and page 1868, 3rd column).

Therefore, it would be expected that the zirconium in the zirconium alloy disclosed by Mardon et al. ('995) would contain 20-450 ppm chromium, 20-50 ppm vanadium and 20-50 ppm tin, as disclosed by Easterday because Easterday teaches that chromium and vanadium would be present in zirconium as impurities (Table 3-4 and page 1867, 1st column, and page 1868, 3rd column).

Still regarding claims 1 and 2, because zirconium makes up at least 98.458 weight percent of the alloy of Mardon et al. ('995), the expected amounts of iron, chromium, vanadium, and tin, with respect to the spectrographic analysis in Table IV, are listed on the following page.

Iron in Zr alloy: 0.98458 x 233 ppm for zirconium = 229 ppm iron for zirconium alloy (which is within the range of that which is disclosed by Mardon et al. (‘995)).

Chromium in Zr alloy: 0.98458 x 68 ppm for zirconium = 67 ppm chromium for the zirconium alloy.

Vanadium in Zr alloy: 0.98458 x the range of less than 20 ppm for zirconium = less than 19.69 ppm vanadium for the zirconium alloy.

Tin in Zr alloy: 0.98458 x the range of less than 20 ppm for zirconium = less than 19.69 ppm tin for the zirconium alloy.

Still regarding claims 1 and 2, Rebeyrolle et al. (‘050) disclose adding 8-30 ppm sulfur to zirconium-based alloys made into tubing sheaths for nuclear reactors in order to double or triple creep resistance and improve uniform corrosion and nodular corrosion behaviors without negatively impacting mechanical and formability properties (abstract, col. 4, lines 9-13, col. 8, lines 1-40 and claims 1-2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add 8-30 ppm sulfur, as disclosed by Rebeyrolle et al. (‘050), to the zirconium-based alloy, as disclosed by Mardon et al. (‘995) with evidence from Easterday, in order to double or triple creep resistance and improve uniform corrosion and nodular corrosion behaviors without negatively impacting mechanical and formability properties, as disclosed by Rebeyrolle et al. (‘050) (abstract, col. 4, lines 9-13, col. 8, lines 1-40 and claims 1-2).

With respect to the limitation “at least the greater part of iron being in the form of $Zr(Nb,Fe,Cr)_2$ or $Zr(Nb,Fe,V)_2$ and which the intermetallic compounds are of a size not

exceeding 200 nm." of claim 2 and in regards to feature “wherein the intermetallic compounds are of a size exceeding 100 nm” of claim 7, the Examiner asserts that these characteristics would be present in the zirconium alloy disclosed by Mardon et al. (‘995) with evidence from Easterday, in view of Rebeyrolle et al. (‘050) because Mardon et al. (‘995) disclose a treatment process (abstract) that would be substantially similar to that of the instant invention as shown below. MPEP 2112.01 I.

	Mardon et al. (‘995) (col. 3, lines 1-40)	**Instant Invention**
1st Step	quenching after heating to 1050°C	quenching after heating to 1000-1200 °C
2nd Step	extruding after heating to 650°C	extruding after heating to 600-800°C
3rd Step	rolling at 580°C	rolling between 560-620°C
4th Step	final heat treatment of 580°C	final heat treatment between 560-620°C

In regards to claims 4-6, Easterday teaches (Table III) that 20-450 ppm chromium and 20-50 ppm vanadium would be present in zirconium as an impurity. Mardon et al. (‘995) disclose that the range of iron would be from 50-250 ppm. Therefore, it would be expected that the quantities of iron, chromium, and vanadium in the zirconium-base alloy of Mardon et al. (‘995) with evidence from Easterday would overlap the ratio range of 0.5 and 30 of chromium and vanadium to iron of the instant invention. It is well settled that there is no invention in the discovery of a general formula if it covers a composition described in the prior art, In re Cooper and Foley 1943 C.D. 357, 553 O.G. 177; 57 USPQ 117, Saklatwalla v. Marburg, 620 O.G. 685, 1949 C.D. 77, and In re Pilling, 403 O.G. 513, 44 F(2) 878, 1931 C.D. 75. In absence of evidence to

the contrary, the selection of the proportions of elements would appear to require no more than routine investigation by those of ordinary skill in the art. In re Austin, et al., 149 USPQ 685, 688. It would have been obvious to one of ordinary skill in the art to select the desired amounts iron, chromium, and vanadium from the ranges disclosed by Mardon et al. ('995) with evidence from Easterday such that the ratio would be satisfied because Mardon et al. ('995) with evidence from Easterday disclose the same utility (zirconium-based alloys) throughout the disclosed ranges.

Double Patenting

Claims 1-2 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 9 and of US Patent No. 6,863,745. Although the conflicting claims are not identical, they are not patentably distinct from each other because in claim 1 of the instant invention, the zirconium-based alloy composition used for the guide tubes of nuclear reactors as shown US Patent No. 6,863,745 compares to the instant invention as follows:

Element	**From Instant Claims**	**US Patent 6,863,745** (claim 9)	**Overlapping range**
Fe	-	0.02-1% (200 - 10000 ppm)	
Cr	-	0.01-0.25% w/o V (100 - 2500 ppm)	-
V	-	0.01-0.25% w/o Cr (100 - 2500 ppm)	-
Fe+Cr+V	200 - 700 ppm	400 - 15000 ppm	400 - 700 ppm
Nb	0.8%-1.3%	0.8%-1.3%	0.8%-1.3%
C	less than 100 ppm	less than 100 ppm	less than 100
S	10 - 35 ppm	5 - 35 ppm	10 – 35 ppm
Si	less than 50 ppm	-	0 ppm
O	1100 -1700 ppm	less than 2000 ppm	1100 - 1700 ppm
Zr	remainder	remainder	remainder

It would be obvious that the equation (Nb-0.3)/(Fe + Cr+ V) > 2.5 would be satisfied for the instant invention. For example, if Nb = 0.8%, Fe = 0.02% (200 ppm), Cr = 0.01 (100 ppm), and V = 0%, then the result is 16.67 which is greater than 2.5.

In regards to claim 2 of the instant invention, the zirconium-based alloy compositional comparison is shown above. The comparison of the processes used to make the zirconium-based alloy are shown for US Patent 6,863,745 and the instant invention are shown below.

	US Patent 6,863,745 (claim 9)	Instant Invention
1st Step	quenching after heating to 1000-1200°C	quenching after heating to 1000-1200 °C
2nd Step	extruding after heating to 600-800°C	extruding after heating to 600-800°C
3rd Step	rolling at 560-620°C	rolling at 560-620°C
4th Step	final heat treatment of 560-620°C	final heat treatment at 560-620°C

If the same composition were subject to the same processing conditions, then an intermetallic compound size not exceeding 200 nm would be expected in both US Patent 6,863,745 and the instant invention. MPEP 2112.01 I.

(10) Response to Argument

Response to arguments with respect to claims 1 and 2

First, the Appellant primarily argues that the Office Action of 18 August 2008 admits on page 3 that Mardon et al. (‘995) fails to teach or show the claim requirement of “10 to 35 ppm of sulfur” as required in claim 1; although Rebeyrolle et al. (‘050) does

disclose an alloy including sulfur, there is no teaching or motivation to combine the sulfur of Rebeyrolle et al. (‘050) with Mardon et al. (‘995); in Rebeyrolle et al. (‘050) the sulfur is added to the alloy to provide an improvement in creep and corrosion resistance in addition to nodular-corrosion resistance whereas and Mardon et al. ('995) already addresses these concerns by providing a lower iron level. The Appellant further argues that Mardon et al. (‘995) states “[t]ests showed generalized corrosion resistance in a high temperature aqueous medium representative of conditions in high pressure water reactor comparable to those of known Zr-Nb alloys having a high niobium content; they also showed creep strength much better than that of known alloys and very comparable to that of the best 'Zircaloy 4’ alloys.” (Col. 3, lines 27 to 33) and the creep and corrosion resistance of Mardon et al. ('995) are adequate without sulfur and there is no reason that one of ordinary skill in the art would turn to Rebeyrolle et al. ('050) and modify Mardon et al. ('995).

In response, creep behavior is a definite concern in the art of zirconium base alloys used in nuclear reactor applications (see col. 1, lines 28-37 of Mardon et al. (‘995) and col. 2, lines 9-28 of Rebeyrolle et al. (‘050)). Although Mardon et al. (‘995) discloses that the low levels of iron would provide satisfactory high temperature creep behavior (col. 1, lines 40-51), only with 8-30 ppm of sulfur in the zirconium-base alloys can the creep resistance, with respect to conventional zirconium-base alloys and the best Zircaloy-4 alloys used in nuclear reactors, be doubled or tripled without negatively impacting mechanical and formability properties (see abstract, col. 4, lines 9-13, col. 8, lines 1-40 and claims 1-2 of Rebeyrolle et al. (‘050)). Thus, one having ordinary skill in

the art would modify Mardon et al. (‘995) in view of Rebeyrolle et al. (‘’050) if one desires to optimize creep resistance without impacting mechanical and formability properties.

Second, the Appellant primarily argues that because Mardon et al. (‘995) is silent with respect to the sulfur content, Mardon et al. (‘995) teaches away from the use of sulfur because an alternative solution is provided.

In response, the Examiner notes that that Mardon et al. (‘995) discloses “To this end, the invention provides in particular a method of manufacturing zirconium-based alloy tubes also *containing* 50 ppm to 250 ppm iron, 0.8% to 1.3% by weight niobium, less than 1600 ppm oxygen, less than 200 ppm carbon, and less than 120 ppm silicon” (Emphasis added). The transitional phrase “containing” would not teach away from the presence of sulfur because "containing" would be open to additional elements, including sulfur, and thus would not teach away from the presence of sulfur.

Third, the Appellant primarily argues that the zirconium sponge material quantities listed in Easterday are not representative of the zirconium found in Mardon et al. (‘995) because Mardon et al. (“995) has very low iron levels and the combination of iron, chromium, and vanadium in Easterday far exceeds the limits of Mardon et al. (‘995); the concentrations of iron, chromium and vanadium once the alloy has been made are not disclosed in Easterday; Easterday admits that the samples were manipulated to provide a wide concentration range for the elements listed in Table I; and one of ordinary skill in the would not expect that the ranges disclosed in Easterday would be typical of any zirconium alloy.

In response, the Examiner notes that Mardon et al. ('995) discloses 50 to 250 ppm iron and the presence of unavoidable impurities (abstract and col. 3, lines 1-8) and just as iron in this range would be expected from typical zirconium samples as evidenced by Easterday (Tables III-IV and pg. 1868, col. 3) the unavoidable impurities as disclosed by Mardon et al. ('995) would include amounts of chromium, vanadium, and tin, as evidenced by Easterday. Although some samples in Easterday may have been manipulated (Table I as referred to by Appellant), this does not mean that all of the samples have been manipulated. Furthermore, the results presented in Tables III and IV of Easterday do not appear to be manipulated as they refer to typical (non-manipulated) zirconium samples.

<u>Response to argument with respect to claims 4-6</u>

The Appellant primarily argues that Easterday's concentrations are simply not applicable to the zirconium in Mardon et al. ('995).

In response, the Examiner notes that Mardon et al. ('995) discloses 50 to 250 ppm iron and the presence of unavoidable impurities (abstract and col. 3, lines 1-8) and just as iron in this range would be expected from typical zirconium samples as evidenced by Easterday (Tables III-IV and pg. 1868, col. 3) the unavoidable impurities as disclosed by Mardon et al. ('995) would include amounts of chromium, vanadium, and tin, as evidenced by Easterday. Although some samples in Easterday may have been manipulated (Table I as referred to by Appellant), this does not mean that all of the samples have been manipulated. Furthermore, the results presented in Tables III and IV

of Easterday do not appear to be manipulated as they refer to typical (non-manipulated) zirconium samples.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Jessee Roe/

Examiner, Art Unit 1793

Conferees:

Roy King

/Roy King/

Supervisory Patent Examiner, Art Unit 1793

Stanley Silverman

/Stanley Silverman/

Supervisory Patent Examiner, Art Unit 1793